What is claimed is:

1. A nanofluidic device comprising:

at least one channel including a combination of thin and thick regions, the thin regions in the channel being thin enough to act as a constriction of small objects, and the thick regions in the channel having a thickness greater than that of said thin regions, and being large enough to allow the passage of said objects.

2. The device of claim 1, further including channels leading from said at least one channel to fluidic components.

3. The device of claim 2, further including a force to drive said objects through said channel.

4. The device of claim 3, further including inlet and outlet apertures for said channel.

5. The device of claim 4, wherein a part of said combination of thin and thick regions is used to collect and trap said objects.

6. The device of claim 5, wherein said thin regions are used to control the flow of said objects in microfluidic channels and chambers.

7. The device of claim 6, wherein at least some of said thin and thick regions contains supporting structures to maintain the uniformity of the thickness of the said regions.

8. The device of claim 7, wherein said thin and thick regions are alternately spaced along said channel.

9. The device of claim 8, wherein the thickness of said thin region is between about 5 nm and about 500 nm.

10. The device of claim 9, wherein the thickness of said thick region is between about 0.1 micron and about 10 micron.

11. The device of claim 10, further including means for applying a voltage across said channel for producing electrophoresis of said objects.

12. The device of claim 11, further including fluidic channels for introducing said objects into the channel.

13. The device of claim 12, further including multiple nanofluidic sieving channels, optimized for different size range, for receiving a mixture of wide variety of objects.

14. The device of claim 13, further including a fluidic chamber, bounded by said regions for collecting molecules into a narrow band for further analysis.

15. The device of claim 14, further including multiple loading and collection chambers, which are separate from one another, each containing a set of multiple channels for the analysis of multiple samples.

16. A method for separating DNA molecules, proteins, cells or other similar-sized objects, comprising;

supplying molecules in a fluid to a nanofluidic channel having alternating thin and thick regions, the thin regions being smaller than the size of the molecule to be separated, and the thick region being substantially close to or larger than the size of the molecule to be separated; and,

applying a driving force to cause said molecules to move along said channel through said regions, the thin regions causing trapping of selected molecules.

17. The method of claim 16, further including changing the length of the thick regions to vary the relaxation property of the molecule in the thick regions.

18. The method of claim 17, further including collecting many molecules into a narrow band, by way of applying an appropriate driving force and entropic barriers in the microfluidic or nanofluidic channels.

19. The method of claim 19, further including launching the collected molecules by suddenly increasing the applied driving force, enabling molecules to escape the barrier.

20. A method for fabricating a nanofluidic device, comprising;

forming a first pattern of shallow regions in a substrate;

forming another pattern of deep regions, excluding regions to be made as thin regions; and

covering the patterns of shallow and deep regions to form a nanofluidic device with thin and thick regions.

21. The method of claim 20, wherein the steps of forming the first and second patterns comprises a two-level lithography and etching process.

22. The method of claim 21, further including covering the first and second patterns of shallow and deep regions with an electrically insulating layer.

23. The method of claim 22, wherein the covering of the regions includes bonding a plate to the substrate, the plate extending over the shallow and deep regions.

24. A device for separating molecules, the device comprising:

a plurality of alternating constricted and unconstricted regions forming a channel;

the unconstricted regions having a transverse dimension and length sufficient to allow a larger molecule to approach its equilibrium shape as it moves through the channel in response to a driving force; and,

the constricted regions having a transverse dimension sufficiently small to influence the shape of some of the molecules moving through the channels.

25. The device of claim 24 wherein the constricted regions provide a trapping point adjacent an unconstricted region, and wherein the larger molecules have a wider contact area at the trapping point of the constricted regions, and thus have a higher probability of escaping the unconstricted region through a constricted region than a smaller molecule.

26. The device of claim 24 wherein molecules in the unconstricted regions are in a relaxed state, and are entropically hindered from entering adjacent constricted regions in the channel.

27. The device of claim 24 and further comprising a substrate supporting the channel.

28. The device of claim 24 wherein the constricted regions are nanofluidic, and the unconstricted regions are obstacle free.

29. The device of claim 24 wherein the equilibrium spherical shape of a smaller molecule has a radius of gyration, and wherein the constricted region has a transverse dimension less than such radius of gyration.

30. The device of claim 24 wherein both large and small molecule need to deform from their equilibrium states to enter the constricted region.

31. The device of claim 24 wherein the equilibrium shape of the larger molecule is influenced by the constricted region to a greater extent than the equilibrium shape of a smaller molecule.

32. A device for separating molecules, the device comprising:

a plurality of alternating constricted and unconstricted regions forming a channel;

the unconstricted regions having a depth and length sufficient to allow a larger molecule to approach its radius of gyration as it moves through the channel in response to a driving force;

the constricted regions having a depth less than a radius of gyration of a smaller molecule; and

means for applying force to molecules in the channel.

33. The device of claim 32 wherein the constricted regions provide a trapping point adjacent an unconstricted region, and wherein the larger molecules have a wider contact area at the trapping point of the constricted regions, and thus have a higher probability of escaping the unconstricted region through a constricted region than a smaller molecule.

34. The device of claim 32 wherein molecules in the unconstricted regions are in a relaxed state, and are entropically hindered from entering adjacent constricted regions in the channel.

35. The device of claim 32 and further comprising a substrate supporting the channel.

36. The device of claim 32 wherein the constricted regions are nanofluidic, and the unconstricted regions are obstacle free.

37. The device of claim 32 wherein the equilibrium spherical shape of a smaller molecule has a radius of gyration, and wherein the constricted region has a transverse dimension less than such radius of gyration.

38. The device of claim 32 wherein both the larger and smaller molecule need to deform from their equilibrium states to enter the constricted region.

39. A device for separating molecules, the device comprising:

an input reservoir and an output reservoir;

a plurality of alternating constricted and unconstricted regions forming a channel coupled between the input and output reservoir;

the unconstricted regions having a depth and length sufficient to allow a larger molecule to approach its equilibrium spherical shape as it moves through the channel in response to a driving force; and,

the constricted regions having a depth less than an equilibrium spherical shape of a smaller molecule.

40. The device of claim 39, wherein the input and output reservoirs are positioned to contain a buffer solution with molecules to be separated.

41. The device of claim 40 and further comprising a first contact positioned within the input reservoir to contact the buffer solution and a second contact positioned within the output reservoir to contact the buffer solution.

42. The device of claim 39 and further comprising a detector positioned about the channel to detect desired molecules in the channel.

43. The device of claim 42 wherein the detector comprises an optical microscope.

44. A device for separating molecules, the device comprising:

a loading chamber;

a plurality of separation channels coupled to the loading chamber, each separation channel having a plurality of alternating constricted and unconstricted regions;

the unconstricted regions having a depth and length sufficient to allow a larger molecule to approach its equilibrium spherical shape as it moves through the separation channel in response to a driving force; and,

the constricted regions having a depth less than an equilibrium spherical shape of a smaller molecule.

45. The device of claim 44 wherein different separation channels have different structural parameters selected from the group consisting of a transverse dimension and length of each of the regions.

46. The device of claim 45 wherein the parameters are optimized for the separation of different length ranges of molecules.

47. The device of claim 44 wherein the loading chamber comprises multiple support pillars.

48. The device of claim 44 wherein the loading chamber is coupled to a loading channel by an entropic barrier.

49. The device of claim 44 wherein the loading chamber is coupled to a first electrical contact through an entropic barrier.

50. The device of claim 49 wherein the separation channels are coupled to a second electrical contact, and wherein the first and second electrical contacts provide an electric field for driving molecules through the separation channels when coupled to a power source.

51. A device for separating larger molecules from smaller molecules, the device comprising:

a channel having a depth and length sufficient to allow larger molecules to approach their equilibrium spherical shape; and

means for creating a series of entropic barriers to selected molecules in the channel.

52. The device of claim 51 and further comprising means for driving the molecules through the channel.

53. A device for separating molecules, the device comprising:

a sequence of an unconstricted region and an entropic barrier forming a channel;

the unconstricted region having a transverse dimension and length sufficient to allow selected molecules to approach their equilibrium shape as they move through the channel in response to a driving force; and,

the entropic barrier influencing the shape of selected molecules as they move through the channel.

54. The device of claim 53 wherein the entropic barrier provides a differential delay of molecules moving through the channel based on the size of the molecules.

55. The device of claim 53 and further comprising further alternating unconstricted regions and entropic barriers forming the channel.

56. A device for separating molecules, the device comprising:

a plurality of alternating constricted and unconstricted regions forming a channel;

the unconstricted regions having a transverse dimension and length sufficient to allow a larger molecule to approach its equilibrium shape as it moves through the channel in response to a driving force; and,

the constricted regions having a transverse dimension sufficiently small to modulate a time it takes selected molecules to pass through the constricted regions, wherein both large and small molecules pass through the channel.